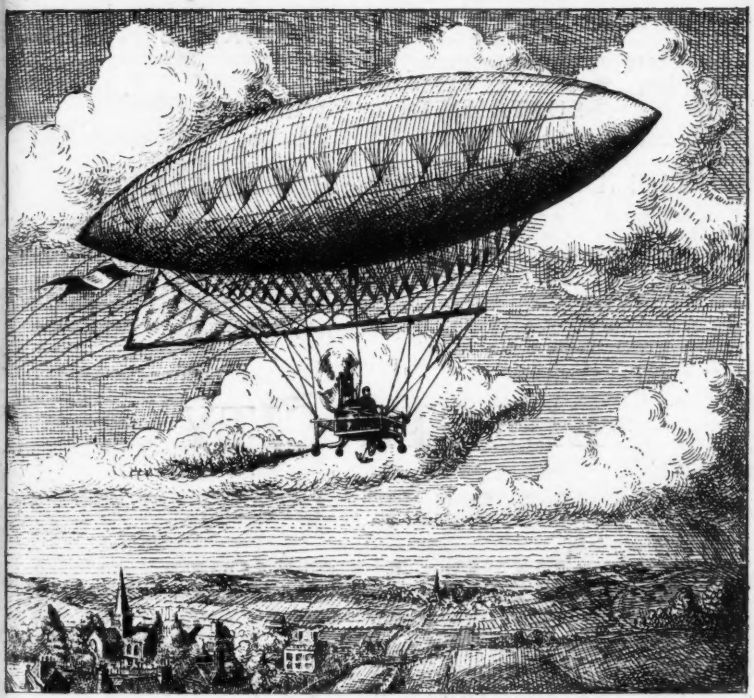
Light and Lighting

Vol. XLI.—No. 7 July, 1948 Price: One Shilling



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Incorporating "The Illuminating Engineer."

Official Journal of The Illuminating Engineering Society.

Vol. XLI.—No. 7. July, 1948 PRICE ONE SHILLING Subscription 15/- per annum, post free

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Next Time?

THE very successful I.E.S. convention held in London in 1946 was "for once" —a unique event.

But we all hope that the **First Summer Meeting,** recorded in this issue, is only the first of a long series, and before long we may be asking again, "When?" and "Where?"

It would no doubt be wise to allow a reasonable interval, two or even three years, between successive meetings. Otherwise what should be a rare treat might well become a familiar burden.

It would also be expedient, at least for some years to come, for the I.E.S. to aim at some agreeable site like Harrogate, well accustomed to conferences and well able to entertain visitors, and in a central, easily accessible position.

Illumination Notes and News

The First I.E.S. Summer Meeting

As readers of this journal are aware the American I.E.S. has for many years staged an annual convention, which serves to bring together members distributed over a very wide geographical area. In 1938-39 the holding of something similar in this country was already being considered, though some little doubt may have been felt whether it was likely to succeed equally well in Great Britain, where distances are so much less and where, at that time, the membership was concentrated mainly in London and its vicinity.

The outbreak of war inevitably led to postponement, but experience during the war years led to the belief that this was no drawback; for in the meantime the remarkable growth in membership and the setting up of centres and groups throughout the country quite transformed the situation and presented the project in a very favourable light. Further encouragement was derived from the very successful Convention held in London in 1946, though it was thought prudent to defer the holding of the first "summer meeting" until 1948.

On pp. 137-144 readers will find an account of this summer meeting, held in Harrogate during June 16-18—the first venture of this kind ever attempted by the I.E.S. in this country. By general agreement the meeting proved a great success. The choice of such a convenient and pleasant spot as Harrogate was a fortunate one, the series of papers, all of which lent themselves well to demonstrations, reached a high standard, and the various social events passed off with that bland and agreeable smoothness which is the hallmark of good organisation. There were one or two minor inspirations in the handling of meetings that deserve note—such as the enlisting of Mr. E. G. R. Taylor (chairman of the North Midland Area) and Mr. E. A. Fowler (chairman of the Leeds Centre) to preside on successive days, after the president had opened the proceedings on the opening evening; and the interval for coffee during each morning session which enabled members to stretch their legs and authors to put the finishing touches to apparatus. The Society was also fortunate in having put at their disposal such an excellent lecture theatre, equipped with all the necessary stage gadgets, including a drop curtain behind which preparations for the next event could be made.

The president, in his remarks at the dinner and in winding-up on the Friday, paid full tribute to the three factors mainly responsible for these good results—the generous hospitality of the Harrogate civic authorities, the wonderful team work of the summer meeting committee and those associated with the Leeds and Sheffield Centres, and the high standard of effort maintained by Mr. G. F. Cole and the staff at headquarters in launching this new venture. There was also present, however, another

imponderable but powerful element, the instinctive friendliness and good will, which one is happy to think, is somehow always found in full measure at I.E.S. functions.

Above all the meeting was signally successful in its aim of affording an opportunity for members from various centres to meet together. It will surely be followed by others.

Brighter Streets Next Winter

The recent announcement in the Commons by the Minister of Transport (Mr. Alfred Barnes) that street lighting is to be increased by 50 per cent. in the autumn (the permissable amount being 75 per cent. instead of 50 per cent. of the pre-war value) is encouraging. It is estimated that the cost in fuel will be little more than one quarter of one day's coal output. Let us hope that consideration of this fact will prevent sudden withdrawal of the concession in the event of the coal situation becoming less favourable than anticipated. One would also like to see some relaxation of the ban on shop window lighting, at least during the period of the Christmas trade—but perhaps this is too much to hope for.

A Graceful Act

A graceful act and a very pleasant event was the informal luncheon given on June 24 at the Mayfair Hotel by Mr. Preston Millar, supported by Mr. Ward Harrison, to which a number of leading I.E.S. members were invited. This hospitable effort was in the nature of a "return match"—Mr. Millar having been similarly entertained in London prior to the last I.C.I. Conference, when all those now invited had been present. A good opportunity for the exchange of views on international co-operation in the lighting field was presented. All agreed on one point—a point also emphasised in Mr. Ward Harrison's address at Harrogate—that in this field friendly co-operation and fruitful discussion are quite exceptionally easy to bring about.

Eleventh I.C.I. Meeting

As we go to press news reaches us of the eleventh session of the International Commission on Illumination, which took place in Paris during June 29 to July 7. It is indeed gratifying to note the revival of the I.C.I., over which Dr. N. A. Halbertsma—so closely associated with this work for many years—presided. We gather that the meeting was a most successful one. It was attended by some 400 representatives of 16 nations, the largest overseas contingent being from Great Britain (66 representatives). Excellent arrangements were made by the French committee and altogether the event was a very pleasant as well as an instructive one. We hope to give a fuller account of the proceedings in our next issue.

Back Copies of I.E.S. Publications Required

Mr. Gunnar Pleijel, of Sweden, who has been a member of the I.E.S. for many years and who has done considerable work on daylighting, is anxious to obtain copies of the following publications and any others dealing with daylighting. Any member who has such copies to dispose of is asked to communicate with Mr. Pleijel, whose address is Oregrundsgaten, 10, Stockholm, Sweden.

The publications required are:—

The Illuminating Engineer
1914: January, February, July.
1923: April, May.
1928: January.
1931: December.

Light and Lighting
1941: No. 4.
1944: No. 1.

Transactions of the Illuminating Engineering Society
1943: No. 7.
1944: No. 8.
1945: Nos. 1, 8, 10.
1946: No. 7.

N.P.L.: Open Day

This year the annual "at home" days at the National Physical Laboratory were June 21 and 22 and a very large number of visitors on both days took the opportunity of seeing something of what was going on at this institution.

As would be expected, most of the work of direct interest to readers of LIGHT AND LIGHTING was that shown in the photometry building, although in the other section of the light division, concerned mainly with optics, there were spectrophotometers and a new type of colorimeter in which the light to be measured was matched with a mixture of six lights intead of the customary three. This is for the purpose of producing a closer energy match between the test light and the mixture, so that the results are less liable to variation according to the colour vision of the observer. It is hoped that with an instrument of this kind, now being constructed for the photometry section, it will be possible to make more accurate measurements of the highly coloured light given by such sources as mercury or neon discharge tubes or fluorescent lamps of different colours used for decorative purposes. This section of the laboratory has recently acquired a Hardy recording spectrophotometer which gives an automatic trace of the spectral reflection or transmission curves of a coloured material.

In the photometry section, in addition to the exhibits illustrating the measurement of the luminous flux from fluorescent lamps (usually measured in the 10 ft. sphere) or from filament lamps, there were also shown the equipment used for examining ships' navigation lanterns and that used in testing rear reflectors for bicycles.

The continual extension of photometric methods to all kinds of photometric measurement was very noticeable. For example, fluorescent tubes are now measured with an emission type of photocell, a colour filter being used to correct the sensitivity curve of the cell to that of the average eye. One of the most difficult problems in the photometry of fluorescent lamps is that of making the accompanying electrical measurements without distorting the wave-form in the lamp circuit and the methods used for making these measurements was demonstrated.

A new exhibit was that of the way in which the light given by a rocket or parachute flare during the course of its burn was recorded. The flare illuminated a photocell and the resulting current was indicated on a milliammeter which was photographed at short intervals, so that the candle-power of the flare could be obtained by independent calibration of the apparatus with a visual illumination photometer.

A visual problem which is being investigated in this section of the laboratory is that of determining the best conditions for viewing the echo trace on a radar display tube. The principal exhibit in the field of visual research was, however, that of Dr. Stiles who is studying the spectral response curves of the various mechanisms responsible for vision in the human retina. The principle he is using is to measure the smallest perceptible intensity of a monochromatic test stimulus applied at a particular point of the retina when the eye has been brought into various states of adaptation by exposure to an extended field illuminated by light which may or may not be of the same colour as the test light. We understand that Dr. Crawford (who was associated with Dr. Stiles in the discovery of the Stiles-Crawford effect) has recently completed a new determination of the spectral sensitivity curve of the eye at extremely low brightness levels. The wave-length of maximum sensitivity under these conditions is nearer the blue end of the spectrum than at ordinary brightness levels and it is this difference which accounts for the Purkinje effect, causing blue and green lights to appear much brighter, relatively to red, when the light is very feeble.

In other parts of the laboratory there were a number of exhibits or demonstrations of considerable general interest. For instance, the electron microscope again attracted a great deal of attention and the half-hourly demonstrations of the million-volt spark were always well attended.

I.E.S. Summer Meeting, Harrogate, June 16—18, 1948

The first summer meeting of the Illuminating Engineering Society which was held at Harrogate from June 16 to 18 was such a magnificent success that there is little doubt others will follow. There were more than 300 delegates and guests, amongst whom were representatives of the illuminating engineering industries of the U.S.A., France and other countries. The conference was a happy blend of technical activity and social enjoyment, and it was agreed that the choice of Harrogate as a meeting place was a most happy one.

The opening event was a reception by the Mayor of Harrogate, followed by dancing, in the lounge hall, on Wednesday evening (June 16). This provided an admirable opportunity for a "get-together" on the part of the delegates and from that time onwards everything went with a swing.

His Worship the Mayor followed up his hospitality by officially opening the conference on the following morning (Thursday, June 17), in the Royal Hall, where he extended a civic welcome to the delegates. He spoke of the value of the work of illuminating engineers in aiding the rehabilitation of Britain, claiming that, in spite of what was sometimes said, we were not on our backs and had no intention of being there, and made a statesmanlike appeal to everybody to do their jobs to the best of their ability. If that were done, he said, he believed there would quickly be rapid changes in the circumstances of our country.

The thanks of the delegates were expressed in a happy manner by the President (Dr. J. W. T. Walsh), and the Mayor, to suit whose convenience the proceedings started at the early hour of 9.30 a.m., withdrew to fulfil other mayoral duties elsewhere.

The consideration of technical matters followed and there was a very full day, two papers being presented in the morning, the annual general meeting followed

Informal group, including Dr. J. W. T. Walsh and some of the members of the Summer Meeting Committee.

by a lecture taking place in the afternoon, and the annual dinner being held in the evening.

Plastics in Lighting

The first paper on Thursday morning was "Acrylic Plastics in Lighting," the authors being Dr. W. E. Harper and Mr. H. P. Walker, both of the Plastics Division of Imperial Chemical Industries. Technically known as polymerised methyl methacrylate, and more popularly as "Perspex," it is more or less common knowledge that acrylic plastics came into prominence during the last war through extensive use in cockpit covers and astral domes, and it is available in the forms of sheet, rod, tube, and moulding powder. The sheet material is, of course, most useful to the lighting-fitting designer and it can be obtained in colourless and coloured transparent grades, in opals of different density and colour, and as metallised sheet. This versatility of form, coupled with good optical, mechanical and weathering properties and with easy manipulation, enables acrylic sheet to be used successfully in the construction of many types of reflecting, refracting and diffusing fittings. Very accurate prisms can also be moulded using a high pressure moulding technique. At temperatures higher than 70 deg.—one speaker in the discussion suggested a lower temperature—the material may tend to demould, and the authors point out that this characteristic limits its application and to some extent controls the design of components. Nevertheless, fittings of many types incorporating acrylic shapings and mouldings have been produced for commercial and industrial lighting, mine lighting, street lighting, transport lighting and other applications. Many examples were illustrated by the authors who did not hesitate to point out present shortcomings which, however, there is every likelihood of overcoming. One particular aspect at the moment is the collection of dust due to static charge and the danger of dust abrasion by wind-borne dust or by cleaning, but the paper indicated methods by which this can be mitigated by making use of simple maintenance precautions.

The paper deals with the range of materials, physical and mechanical properties, fabrication techniques, and the application of the material in lighting fittings.

The discussion on the paper was not critical, but rather of an enquiring nature seeking further information.

In reply to various speakers, Mr. H. P. Walker emphasised that the present was only an interim stage in the development of this material. He said his figure of 70 deg. F., as that at which demoulding was likely to take place, had been proved to be a safe one. Generally speaking, he thought that if the material complied with B.S.S., 889, it would be found satisfactory. He added that there was a sharp rise in tensile strength at the higher temperature. Information on some of the other points raised (such as the effect of solar heat and U.V. rays) was, he said, shortly to be made available. The material was being tested in India, and the results would be published when received.

Decorative Lighting

A paper on "Decorative Lighting" was then read by Mr. L. H. Hubble. The author's reasoning was expressed in these terms. Decorative lighting is not so much a practice in itself as an essential component of any lighting scheme. The word "decorative" is misleading in that it implies ornament, whereas, in point of fact, the decorative component of lighting may be only a matter of simplification. Indeed, the modern tendency appears to be towards the avoidance of lighting "decoration" and the substitution of lighting harmony.

Approached in this way, decorative lighting can be analysed in a manner impossible if it were considered to be purely an artistic function. With the aid of such analysis, this aspect of illuminating engineering can be brought within the scope of a great number of lighting engineers who might otherwise feel unqualified to tackle those problems in which decoration is of great importance.

The approach to the decorative component must take the form of a search for harmony, firstly in relation to the prevailing human emotion of those for whom the lighting is designed, and secondly in relation to the architectural characteristics of the space under treatment.

The paper terminated with a detailed description of a particular installation, showing how the above reasoning was

applied. No apology was offered for introducing some technical aspects of decorative lighting since, said the author, the object of the paper was to show that decorative lighting far from being the prerogative of the artist is, indeed, the very epitome of the lighting engineer's vocation. It was a highly complex subject and worthy of higher appreciation than it generally received. We had left behind the days when a lighting engineer was little more than a fittings salesman, and the paper suggested that by careful analysis it might be possible for the lighting engineer to bridge the gap between the few who have a flair for pure conception and the engineer who deals with the more technical aspects. The author agreed there might be many points of disagreement with his views, but added that the object of the paper was not so much to postulate theory or to state facts, as to show the reason and need for the educational programme which the Society was encouraging, and which the President had so fully elaborated for the lighting engineer of the future.

There was a brief discussion on the paper, which was opened by Mr. W. R. Stevens, who said that lighting affected people, and they should be the prime consideration in the design of lighting fittings, adding that he would be a very bold man who would venture to say what was useful and what was good taste!

Annual General Meeting

On Thursday afternoon, June 17, the annual general meeting of the Society was held. The Council's Report and the Statement of Accounts were adopted and a satisfactory financial position was reported. It was announced by the Hon. Treasurer that a superannuation scheme for the staff had been inaugurated. The President reported that Mr. J. M. Waldram had been elected President for the coming year, and the elections for Vice-President and new members of Council were duly announced. The President reported that the Register of Lighting Engineers was now in full swing and that the number of members so registered was increasing.

An announcement of special interest related to the proposed "Trotter Memorial Lecture Fund," in memory of Mr. A. P. Trotter, to whose pioneer work in the field of illuminating engineering the President paid grateful tribute. Full details of the proposals appeared in the June issue of LIGHT AND LIGHTING.

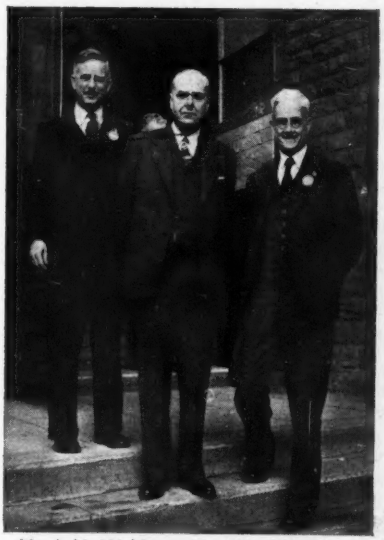
A special vote of thanks was given to Mr. Cole, the secretary, and his staff.

"Some Frontiers of the Lighting Art"

Following the annual general meeting, a lecture on "Some Frontiers of the Lighting Art" was given by Mr. Ward Harrison, who is a past-president of the American I.E.S. and Director of Engineering for the Lamp Department of the General Electric Co. (U.S.A.).

The President, introducing Mr. Ward Harrison, and remarking that his name was a household word to every lighting engineer, said it was a thrill to meet the originator of the technique of the "co-efficient of utilisation." Since he introduced this, Mr. Ward Harrison had turned his attention in other directions and some more "horrors" were in store for the lighting engineer!

Mr. Ward Harrison, first on behalf of his colleagues in the American Illuminating Engineering Society, and secondly on behalf of himself, acknowledged the high honour of being invited to give this lecture on "Some Frontiers of the Lighting Art." Commenting on the fact



Mr. J. M. Waldram, Mr. Ward Harrison, and Dr. J. W. T. Walsh.

Some of the delegates from France. Left to right—M. Henri Maisonneuve, M. J. Boski, M. R. Lancelot, M. Jean Chappat and M. R. Nampon.

that he read through the periodicals from this country dealing with illumination, he said jokingly that some in America looked with tolerance tinged with something akin to superiority at our efforts to overturn such a seemingly simple, tried and serviceable term as "footcandle." He noted that we had now passed through the stages of the cumbersome "lumens per square foot" to "l.s.f.," and most recently to "luf." How would the layman know whether the plural was "luf" or "lufs"! Seriously, however, he asked whether more would not be accomplished for the progress of the lighting art if the effort needed to effect such a change were instead directed towards bringing about a familiarity with brightness units and their relatively greater significance on seeing.

On the other hand, he admitted that many idosyncrasies of American lighting engineers were no doubt even more apparent to us in this country. In America they were giving thought to such terms as "delos.," "helios.," "logance" and "pharosage"—all of which might or might not succeed in attaining general acceptance over the long term.

Coming to the precise subject of his lecture, he said that to say to-day we had no lack of challenging frontiers was a considerable understatement. More truthfully, we were burdened with a superfluity of them but on this occasion he desired to concentrate thoughts on the last three of a list which he enumerated, viz. (1) desirable levels of illumination; (2) suitable brightness distribution surrounding the visual task, and (3) ocular comfort when the eyes are raised from the work.

These three were perhaps the most important considerations in illuminating engineering and they were still our frontiers.

After dealing with each of them in great detail, he said he realised he had been able to contribute but little towards their exploration. Nevertheless, could we not agree:—

(1) That further laboratory work should be undertaken on foot-candle, or rather foot-lambert, levels desirable for various tasks, taking into account in

Mr. F. M. Woods, Dr. Walsh, Mr. Ward Harrison and Mr. W. G. Thompson.

each case the physiological cost of seeing.

(2) That we should try to learn more about surround brightness patterns which were satisfying and contributed to ease of seeing; and that practical engineers should endeavour to design lighting systems so as to minimise undesirable specular reflections.

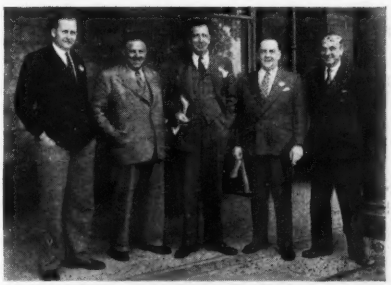
(3) That the proposal concerning a numerical evaluation of direct glare should be subject to serious and searching criticism. No representations are made that the exponents used in the empirical formula are precise, but even if by trial they are found to be materially in error, is it not worth while to correct them and then proceed to put them into use? To paraphrase Lord Kelvin, numerical evaluation is essential to the understanding and solution of all scientific problems.

Mr. W. J. Jones, proposing the vote of thanks to Mr. Ward Harrison, said he liked the impish reference to our attempts to inter the foot-candle, but retaliated by saying that "delos," "helios," "logance," and "pharosage" were Greek to him! However, both countries in their seeking of new names had this in common—the desire to emphasise the importance of brightness and to put candle-power into the background. Mr. Ward Harrison had put the cost of good lighting in its true perspective. The fact was that in this country the cost per unit of light had been reduced to less than one-tenth of that in 1914, and there was no economic reason why satisfactory levels of illumination should not be made available everywhere.

The Annual Dinner

The annual dinner was held in the evening at the Grand Hotel, Harrogate, and a very happy evening was spent by the 300 or so delegates and guests, the principal guests being Mr. Ward Harrison (Past President, American Illuminating Engineering Society) and M. Henri Maisonneuve (Past President, Association Française des Eclairagistes).

Mr. Ward Harrison, proposing "The Illuminating Engineering Society," said he brought greetings from his own land, and particularly from the many friends the illuminating engineers of this country had there. He recalled Mr. Waldram's presence at the Illuminating Engineering Convention in the United States. Commenting on the manner in which the U.S.A. and France had collaborated during the war, he said that everyone would hope we had seen the last of international conflict. He then dealt with the relation of highway authorities and architects to illumination, emphasising that it was gradually being borne in on highway authorities that the cost of damage to property and human life due to bad lighting conditions would very soon pay for an adequate street lighting installation. As to architects, he said they were being forced, willy nilly, to the consciousness that artificial light played a part in many buildings during the majority of hours, and that with the advent of the new forms of lighting they could build the lighting units into their structures instead of just sticking them on. Reconstruction rather than new building was likely to be a big business for some years ahead, but in the future efforts of the architectural profession



Left to right—Mr. H. Elliott, Mr. K. R. Mackley, Mr. S. Elliot-Smith, Mr. R. V. Stephens and Mr. E. G. Sellers.

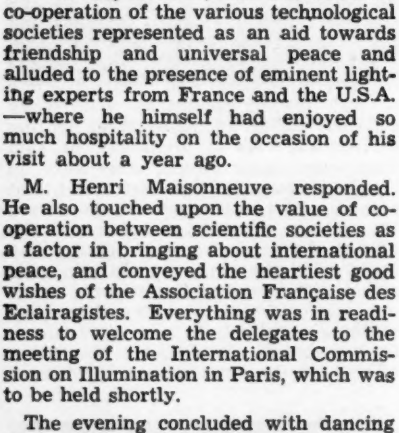
might influence lighting more profoundly than any other single factor.

The President responded to the toast. In doing so he reciprocated the good wishes sent by the American Illuminating Engineering Society, and expressed the great pleasure which Mr. Ward Harrison's presence had given, and the interest with which they had heard his remarks on two occasions that day. He also expressed the gratitude of the Society to the civic authorities of Harrogate for their hospitality, and to local I.E.S. members and the headquarters staff for their excellent preparatory work in connection with the meeting.

Mr. W. R. Stevens proposed "The Guests" in a lively speech with many touches of humour. (He quoted, at intervals, Dr. Johnson, Lord Tennyson, and Dorothy Parker.) He welcomed the co-operation of the various technological societies represented as an aid towards friendship and universal peace and alluded to the presence of eminent lighting experts from France and the U.S.A. —where he himself had enjoyed so much hospitality on the occasion of his visit about a year ago.

M. Henri Maisonneuve responded. He also touched upon the value of co-operation between scientific societies as a factor in bringing about international peace, and conveyed the heartiest good wishes of the Association Française des Eclairagistes. Everything was in readiness to welcome the delegates to the meeting of the International Commission on Illumination in Paris, which was to be held shortly.

The evening concluded with dancing and a cabaret.



Mr. W. R. Stevens and Dr. E. C. Walton.

Mr. E. A. Fowler and Mr. E. B. Sawyer.

Department Store Lighting

On the following morning (Friday, June 18) Mr. Alan W. Jervis presented a paper entitled "Department Store Lighting: Factors Influencing the Design."

Mr. Jervis is the consulting engineer to the largest group of stores in this country, and has been associated with stores for more than 20 years. He has represented store interests on various Government Committees and is technical adviser to various trade associations. In introducing his subject, he remarked that the lighting of stores has not always been carried out with a proper appreciation of their particular requirements. Yet, with the large-scale rebuilding programme necessary because of wartime destruction, it is essential that recent developments in light sources should be used to the greatest advantage.

The paper reviewed the problems associated with store lighting. The cost of electricity, he pointed out, plays an important role in deciding a scale of lighting that will balance with the economics of store operation as well as with the interior lay-out and the grade of merchandise sold. The location and growth of each individual store will have developed a particular atmosphere which must be retained as part of the lighting design. It was emphasised that fluorescent lamps allow an entirely different form of light treatment from tungsten filament lamps, but that their colour-rendering properties are not yet entirely satisfactory. Highlights are important to give each department of the store a distinctive character, as well as to emphasise special features of the display; they also help to relieve the monotony of large uniformly lighted areas. Because of the long vistas, the

angle of vision of lighting fittings is almost zero, and in the past this, in the author's view, has been overlooked to a great degree.

Suggestions for the achievement of balanced lighting schemes, embodying both general lighting and emphasis lighting, were made in the paper. It was emphasised that department stores, through their own usage, represent in themselves a most effective means of educating the public in the use of lighting. They can show where and to what extent it can be used over an enormously diversified range of services. They are themselves interested, to a large extent, in the sale of domestic fittings, and, as leaders of public taste and fashions, particularly in interior decoration and furnishing, they can, with a little encouragement, be rendered very powerful agents for the future of good lighting in this country.

A series of demonstrations of store lighting effects added greatly to the interest of the paper.

The principal speaker in the discussion was Mr. Oscar Waygood, who emphasised that store lighting had not received the same concentrated engineering attention that the provision of lifts and escalators had. He did not share the author's view that each floor should be treated separately, and preferred a standard form of fitting and a standard form of illumination, but capable of adaptation to suit the particular merchandise exhibited. He mentioned a fitting that could be adapted to give direct or indirect lighting as required. Finally, he said he did not like the author's idea of basing the standard of a lighting installation on turnover. One or two other questions were put and Mr. Jervis briefly replied, reiterating the views in the paper with regard to treating each floor as a separate entity, and also saying that he knew of no better method of deciding on an installation than on the basis of turnover.

New Lamp Developments

Then followed a paper on "New Lamp Developments," by Mr. N. L. Harris, who for 21 years has been with the G.E.C. Research Laboratories, Wembley.

It was pointed out that the history of electric lamp development has been one of steady improvement in the efficiency of the production of light. The lamps used to-day for general lighting have 15 to 20 times the efficiency of those first developed some 70 years ago. The paper, however, surveyed mainly recent achievements and indicated the probable lines of future development. Some new types of carbon arc lamps were described. The view was expressed that filament lamps on the whole are unlikely to advance far beyond their present level of performance. Discharge lamps, however, promise considerable development in several directions.

Typical of progress in fluorescent lamps is the discovery of halophosphate phosphors, giving white light from a single powder having a high degree of chemical stability and already providing an improvement of more than 50 per cent. in the average efficiency throughout life. Simplification of control gear and the rapid starting of lamps are other aspects under constant review and in which developments may be expected. High-pressure metal vapour lamps show improved colour-rendering properties without loss of luminous efficiency by the addition of cadmium and zinc vapours and the use of higher operating temperatures. They are already finding application in cinema and television studios, and give promise of ultimate use in general lighting service.

Other developments reviewed include high intensity flash discharge lamps for use in photographic studios, Press photography, and similar work. The operating circuit can be adapted for using lamps in stroboscopic examinations of moving machinery. Daylight colour matching fluorescent lamps and additions to the range of specialised discharge lamps used in laboratory work are also described.

It was pointed out that the major developments are likely to continue in the fields of fluorescence and the high-pressure metal vapour discharge, but entirely fresh fields may be opened at any time with the crystallisation of a new scientific idea. The constant search for improved light sources, it is emphasised, has considerable economic importance in the present critical times. The great increases made in luminous efficiency of electric lamps imply that if the present level of electric lighting had to be supplied from carbon filament lamps, the country would need about 5,500,000 tons of coal per annum more than is used for modern lighting. An actual

saving of 1,000,000 tons of coal per annum is within sight if present commercial and industrial lighting loads only are converted to the same level of fluorescent lighting. This would conserve power plant by the equivalent of a 300,000 kw. power station, i.e., a generating unit the size of the Battersea station.

There were two speakers in the discussion.

Dr. J. N. Aldrington said this type of paper, making a study as it did of the history of science, in broad perspective, in its relation to lighting, was of the greatest possible help in assisting to select the best source of light for the particular job. Sometimes the lighting engineer was misled into selecting the wrong source of light for the purpose, and that did not help the lamp manufacturer. By constantly re-surveying the country's knowledge in the manner the author had done, we could see the way by which further developments could make use of new materials, perhaps developed in other spheres but applied in the lamp research laboratories.

Mr. F. X. Algar commented on the fact that compensators in the control circuit of the ordinary fluorescent lamp was the common practice in the United States. He understood, however, that the view in this country was that the quicker starting did not justify the extra cost involved. In reply, Mr. Harris said the question of compensators was too large a one to be dealt with at that moment, but he promised a written reply.

Television

The conference was brought to a close on Friday afternoon (June 18), when a lecture on "Television" was given by Mr. L. C. Jesty, who after being in charge of research and development of cathode-ray tubes or television in the G.E.C. Research Laboratories, had joined the staff of Cinema-Television, Ltd., in 1946, and had formed their Advanced Development Department for the investigation of improved television systems suitable for theatre and studio applications.

After expressing the view that the decision to continue the B.B.C. television service on the old pre-war standard of 405 lines had proved to be wise, he said that as the result of war-time experience there was a great improvement in the quality of the transmissions and performance of commercial receivers and larger pictures for home reception, and full-size cinema pictures are now a possibility. Although research and development of new and improved television systems, embodying higher definition and colour, had progressed considerably in the laboratories, it would be some time before these were available commercially for home reception, and their first application was likely to be in the cinemas.

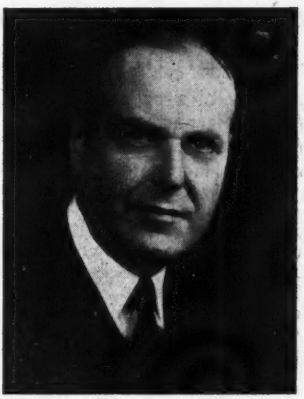
The I.E.S. Secretary with Mr. W. J. Harris.

The lecture was accompanied by a number of television demonstrations and it was pointed out that, apart from cinema theatre requirements of large screen picture of cinematic quality, the studios are attracted by the possibility of using television techniques as an aid to film production. An interesting final demonstration took the form of a film of the Victory Parade, presented first in black and white and secondly in colour —a contrast which was seen with great interest and led to some subsequent discussion amongst members present.

The final social function was an enjoyable visit to the Yorkshire Dales. Other social activities included a visit by the ladies to York on Thursday morning and the final play in the golf competition for the Dow Cup, which has been presented by the North Midland Area of the Society.

Some Frontiers of the Lighting Art

Summary of an Address delivered by Dr. Ward Harrison at the I.E.S. Summer Meeting in Harrogate on June 17, 1948.



Dr. Ward Harrison, Past President and Fellow of the American I.E.S.

In his opening remarks Dr. Ward Harrison conveyed greetings from members of the American I.E.S., alluded to the close bonds existing between workers in the field of illuminating engineering, and referred to the close interest with which the Transactions of the British Society and LIGHT AND LIGHTING are read in the United States. Turning to the subject matter of his address, the author then drew attention to a series of matters on which progress may be expected or further information desired, for example:—

1. In light sources a gain of three or four times in lumens per watt, possible without departing from white light, is theoretically possible.
2. The extensive and pleasing application of coloured light is still an almost unexplored field.
3. Current methods of lighting streets involve the use of too small luminaires at too great distance apart.
4. We are not agreed what foot-candles are desirable and necessary for various indoor tasks as in offices, factories, and schools.
5. We are not agreed as to what brightness patterns, including specular reflection are permissible within the visual field, when the eyes are directed downward toward such tasks.
6. We have no generally accepted method of pre-determining what degree of visual comfort will be experienced when the eyes are raised from the work.

Discussing desirable levels of illumination the author suggested that there need be no concern at not being able to specify the exact illumination for hundreds of different tasks. Experience in factories in war-time had, however, led to the belief that good illumination paid. In offices, drawing offices, and schools, adherence to a three-to-one ratio of brightness meant that, assuming the use of white paper surfaces, desks, floors, filing cabinets, etc., should be finished in light colour.

By the aid of numerous diagrams it was shown how glare, and especially reflected glare, could best be avoided.

The sensation of direct glare, the author suggested, was dependent on: (a) Brightness of Sources; (b) Apparent Area of Sources; (c) Height of Sources above Eye Level; (d) Position of Sources in the Field of View; and (e) Brightness of immediate background to luminaire and the general surround.

These five factors had been embodied in the following formula:—

$$\text{Discomfort Glare Factor} = \frac{\text{Apparent Source Area} \times (\text{Brightness})^2 \times \text{Location Coefficient}}{(\text{Height above Eye Level})^2 \times \text{Surround Factor}}.$$

A graph was illustrated, showing how the influence of positions of sources could be estimated, and a table was presented from which the effect of background could likewise be estimated. By this means, it was indicated, installations could be appraised in terms of the glare factor. Finally, in a series of tables presented as an appendix provisional glare factors for various installations using fluorescent lamps could be ascertained.

Acrylic Plastics in Lighting

Summary of a paper read by Dr. W. E. Harper and Mr. H. P. Walker at the I.E.S. Summer Meeting, Harrogate, on June 17, 1948

One advantage of acrylic plastics is the variety of forms in which it can be produced to meet the requirements of the lighting engineers. Its high clarity makes it an excellent medium for carrying dyes and pigments, and sheets are available in several colours. If used as diffusing mediums four acrylic opals are available with varying transmission factors, and as a specular reflector acrylic sheet can be polished as plate glass, making it a suitable base for reflecting coatings. Other optical effects can be obtained by treatment of the standard product.

Physical and Mechanical Properties

Perhaps the most obvious optical property of colourless acrylic sheet is its high clarity. For thicknesses up to two inches experimentally determined transmission factors approximate to 92.5 per cent., a value approaching closely to that for zero absorption. This property has found interesting application in lighting by total internal reflection. Transmission of near ultra-violet radiation is also high, and the material should be an efficient carrier for luminescent powders.

The different forms of acrylic sheet can meet many of the optical requirements of the lighting fitting designer, but continued collaboration between illuminating and materials engineers will doubtless lead to the introduction of varieties with new properties.

Being a thermo plastic, acrylic sheet can be softened by heat and moulded to shape. On further heating, it demoulds and returns to its original shape. As many lighting fittings operate at temperatures considerably above the ambient temperature, this thermal characteristic will often determine whether the material is suitable for a particular application or not. Allowing a reasonable factor of safety, the operating temperature at any point on the external surface of an acrylic moulding should not exceed 70 deg. C. Localised heating may cause local demoulding, and, where possible, the fitting should be designed to distribute the heating over a wider area. The material is almost immune to damage from thermal shock. After heating to its softening point, it can be plunged into cold water without measurably affecting its physical properties.

The fittings designer is concerned with general strength requirements associated with the operation of fittings in ordinary locations, and also with requirements refined by specification for fittings used in special locations, such as mines. "Perspex" combines a low specific gravity with reasonably high tensile and impact strengths, and consequently gives shapings light in weight, self-supporting, and sufficiently strong to withstand normal handling and service operation without breakage. In thin sections, the material can be flexed to an appreciable extent without fracture, a property which can simplify packaging, and reduce the risk of damage during production and transport.

Application in Lighting Fittings

Plastic lighting fittings have been in use in factories and offices for some time, and experience has shown that the reflection factor of the material shows negligible change even in the worst atmospheres, whilst another advantage is resistance to damage by impact or general handling. Special plastic fittings designed for use in the most corrosive atmospheres have been in service for a considerable time and have shown no signs of deterioration, though normal fittings have been ruined in the course of a few months.

The first large-scale application of plastics in street lighting was in fluorescent lanterns where a large transparent area was required and where glass was difficult to apply. Acrylic sheet seemed to meet most of the requirements, and in cold weather it helps to maintain the internal temperature of the fitting at a level which enables the lamps to function with reasonable efficiency. The comparatively low operating temperature of sodium vapour lamps has also enabled suitable fittings for these to be made. Acrylic plastics have also found application for the transparent parts of flameproof mine lighting fittings.

Decorative Lighting

Summary of a paper read by Mr. L. H. Hubble at the I.E.S. Summer Meeting, Harrogate, on June 17, 1948

For the purpose of this paper the author interpreted decorative lighting as that part of any lighting scheme which goes beyond its purely functional requirements and adds to, or at least by discreet handling does not detract from, such aesthetic qualities as are present in the space to be lit. This definition divides the subject into two parts, additive and subtractive.

The additive side of the definition deals with functional lighting which can be improved by treatment. Functional lighting does not necessarily become decorative as a result of a little extra treatment, but it may do so in part if the lighting engineer has not restricted himself to the bare functional needs and has related the appearances of the installation to its surroundings.

The subtractive part of the definition concerns the restraint needed lest the means of lighting should detract from inherent beauty. It raises the question as to whether traditional methods of lighting buildings of antiquity and architectural merit are in themselves a part of the architecture and should therefore be preserved, or whether such lighting equipment should be considered as being apart from the architecture.

The first essential of decorative lighting is that it shall be in harmony with the prevailing human emotion and the first step, therefore, is to decide the atmosphere to create. For example even in lighting an ordinary living room the treatment which would appeal to an elderly studious man would not be appropriate for a busy family man. The treatment of hotels, department stores, etc., must be considered in the same way.

Lighting and Architecture

The subject of the relationship between lighting and architecture is one full of contradictions. Firstly, we have an inherent reverence for antiquity; secondly we wish to enjoy the beauty of craftsmanship in stone and timber, etc.; thirdly we wish to make use of the latest scientific developments; and fourthly we each have our own individual ideas of what is good or bad. It is essential, therefore, that from the very start there must be a compromise.

The lighting engineer is largely concerned in bringing lighting up to date which may be simple if confined to mechanical and purely functional developments—and there are many buildings in which this may be done without giving offence architecturally. There is no doubt, however, that some traditional lighting fittings have become a part of the architectural picture. A typical example is found in the Palace of Versailles, and it would be a very bold man who would dare to remove the great chandeliers and substitute something more modern, however much in good taste the alternative might be. However, the vast majority of lighting of this kind employs relatively insignificant fittings which are not part of the architecture and many buildings would look far better without them.

The shape and size of fluorescent lamps may be advantageous or disadvantageous according to how the lamps are used, but their introduction has given added interest to the problem of the design of lighting installations which are in harmony with their environment. The author describes a number of examples where fluorescent lamps have been in such places as a church, the offices of a publishing house and the vestibule of an imposing block of offices, where it was essential that the characteristic architectural atmosphere should be preserved.

In giving examples of the application of fluorescent lighting to classical or pseudo-classical architecture not only the conception of the scheme, but the functional and practical side of the design has to be considered and the author describes in its entirety one particular scheme for the lighting of a large hotel.

In conclusion the author stresses that the object of the paper is to show that decorative lighting, far from being the prerogative of the artist, is indeed the very epitome of the lighting engineer's vocation. The lighting engineer should not hesitate to add a decorative component to any lighting work and should always endeavour to merge his lighting equipment into the general picture, avoiding incongruity and insincerity.

Department Store Lighting

Summary of a paper read by Mr. A. W. Jervis, on June 18, at the I.E.S. Summer Meeting

In the past many store lighting schemes have fallen into misuse because attention had not been given to the full economics of store operation which are a determining factor in any scheme. Light for the stores is equivalent to power for the factories, and should be considered as such, but it has been shown that the total cost of supplying light, i.e., power, lamp renewals, and labour, should not exceed 0.5 and 0.75 per cent of the total turnover of the store if the lighting scheme is to be an economical one.

Lamp renewals are a matter of some importance in stores, as lighting points are often in places not readily accessible and the disturbance caused by replacements during business hours may easily upset potential customers. It may be thought that lamps lasting the greatest number of hours are the best proposition, but in these days of increasing lumen-efficiencies a lamp whose economics are dependent on long life might bar the user from taking advantage of technical developments. What is required, therefore, is reliability to fulfil a stated performance.

Basis of Design

Stores vary according to the grade of merchandise sold, and the locality in which they are situated, and each type of store will need individual treatment which will retain its characteristic atmosphere. A good lighting scheme must therefore be in keeping with the character of the store whilst at the same time providing a modern standard of illumination which must enhance the value of the merchandise. It is not possible to lay down hard and fast rules for the lighting of stores as each must be considered as a separate problem.

Attention must also be given to the mixture of daylight with artificial light. The amount of daylight entering a building varies according to whether the building faces north or south. It has been found that where direct sunlight penetrates into a building direct lighting is to be preferred, as under these conditions indirect lighting can produce depressing effects. Experiments have been made in the U.S.A. in excluding daylight altogether. Daylight is a most expensive commodity, particularly when full value has been placed on the loss of display space, cost of cleaning, and insurance, etc., but careful consideration should be given to the psychological effect which the exclusion of daylight is likely to produce.

Technical Considerations.

There has been a trend during recent years for the general level of illumination to be increased, due, mainly, to cheaper electricity and a growing realisation of the benefits of good lighting. The requirements of store lighting are general lighting plus highlights, or points of emphasis, which should be used to bring out special features of the display, attract customers off the normal traffic lines, help customers to locate themselves, and the departments they want, and also to give each department a distinctive atmosphere. Highlights also help to break up the monotony of large areas, though the number of such points of emphasis will depend on the structural layout of the store.

The pre-war level of general lighting in stores has been increased from 5 to 8 lumens per sq. ft. to the order of 20 lumens per sq. ft., which is a considerable improvement. Any improvement on this, or, indeed, even the maintenance of this level, will depend on the future cost of electricity, and any further increases in the lamp efficiency.

From the earliest days of electric lighting, stores have been amongst the first users of new light sources. With each new development has come fresh problems associated with its use, not the least of which has been the appearance of the merchandise. Fluorescent lamps are now widely used and, in the opinion of the author, have given the greatest impetus to the development of good lighting that has ever taken place. The advantages and disadvantages of these lamps are well known, but in the store lighting field the greatest disadvantage is that of colour—though there is every indication that this fault will be corrected very soon.

The author also dealt with the problem of glare, both from windows and artificial light sources, and concluded with some views on future developments.

New Lamp Developments

Summary of a paper read by Mr. N. L. Harris at the I.E.S. Summer Meeting, Harrogate, on June 18, 1948

In opening his paper Mr. Harris gave a short historical review of the development of electric light sources over the past 70 years and then dealt briefly with more recent improvements in carbon arc and incandescent filament lamps. He pointed out that the only future improvements which could be expected in filament lamps would be minor ones. In contrast to this field electric discharge lamps give promise of considerable improvements in various directions.

Tubular Fluorescent Lamps

The success of these lamps has depended largely on the development of new and highly efficient luminescent materials, the design of low-pressure mercury vapour lamps of low wattage, and efficient generation of u.v. radiation, and the solution of control circuit problems. Of these factors the successful use of luminescent materials is the vital feature which has made the lamps suitable for general lighting where a pleasing rendering of colours is essential.

The high efficiency of generation of u.v. radiation is dependent upon the pressure of the mercury vapour (and therefore upon the wall temperature of the lamp) and on the current density, and the working compromise which has been adopted between requirements for the optimum production of u.v. radiation and adequately high watts dissipation and light output gives satisfactory results. It may be, the author said, that we are nearing finality in lamp design so far as the low-pressure mercury discharge is concerned, but it is possible that a more efficient generator of suitable u.v. radiation will be developed.

It would appear then, that substantial developments in fluorescent lamp performance depend upon improvements in the phosphors. This subject offers a wide field for research and has already proved a most useful one with promise of further developments to come.

H.P.M.V. Lamps

Since their introduction in 1932, the high-pressure mercury vapour lamp and the sodium vapour lamp have found ready application in the street and industrial lighting fields. The sodium lamp soon reached a luminous efficiency exceeding 70 lumens per watt, and though improvements in lamp life and average performance have been made it would seem that the sodium lamp has reached finality in design.

A feature of high-pressure mercury lamp development was the use of a highly concentrated discharge column as a very high brightness source for projection work. Theoretical and practical work indicates that there is an apparent upper limit to the luminous efficiency of the mercury vapour discharge of the order of 80 lumens per watt, and though commercial lamps have not yet exceeded 40 to 50 lumens per watt it is probable that ultimately lamps giving 75 lumens per watt will be available. Improvements in the colour rendering properties of these lamps have been made possible by the introduction of zinc and cadmium vapours and recent developments in the use of quartz for lamp bodies.

It seems likely therefore that lamps with an efficiency of 50 lumens per watt and a red content of five to ten times that of the present street lighting lamps may soon become available commercially. Correction of the deficiency of red, however important it may be as a first step, must be followed by further work to improve the colour balance in other parts of the spectrum if an entirely satisfactory colour rendering for general lighting is to be achieved.

Other Lamps

The paper includes a resumé of flash discharge tubes, and reference is also made to the recently introduced xenon-filled lamp in which some 10 kw. is dissipated in a water-cooled quartz tube some 20 cm. long and 2 cm. in diameter.

In conclusion the author points out that an actual saving of a million tons of coal per annum could be made if the present commercial and industrial lighting loads alone were converted to fluorescent lighting at the same level of illumination.

The Dow Golf Cup

The final round in the first competition for the Dow Golf Cup was played on the beautiful course of the Oakdale Golf Club at Harrogate on Saturday, June 19, as the final item in the programme of the I.E.S. Summer Meeting.

The winner was Mr. F. S. Polden, of Leeds, with a net score of 74, Mr. R. D. Green, Mr. E. B. Sawyer and Mr. W. D. Sinclair following on with scores of 78. The remaining finalists were Mr. M. N. Wilson, Mr. C. R. Bicknell, Mr. A. D. S. Atkinson and Mr. F. Firth.

In spite of one or two showers the morning was fine on the whole and the finalists went round in very good time. In addition to the players a number of spectators were present and all joined in warmly congratulating Mr. A. Kelso on his organisation of the competition.

The presentation of the cup was made by Mrs. E. G. R. Taylor, wife of the chairman of the North Midland Area and of the Sheffield Centre.

The pictures on this page show (1), the players and spectators inspecting the cup; (2) Messrs. E. B. Sawyer, A. Kelso, C. R. Bicknell, A. D. S. Atkinson and W. D. Sinclair at the first tee; (3) Messrs. E. G. R. Taylor, F. S. Polden, G. E. L. Comrie and A. Kelso; (4) Mr. W. D. Sinclair driving off the first tee; (5) the golf secretary checking the cards; (6) Mr. Taylor filling the cup in traditional manner, and (7) Mrs. E. G. R. Taylor presenting the cup to the winner.

Indirect Lighting of a Generating Station

When, after the electricity shut-down of 1947, Vauxhall Motors, of Luton, decided to instal some 5,000 kw. of diesel driven A.C. generating plant, the only suitable site was virtually underground where provision of natural light was impracticable.

Many factors operated to control the choice of the most suitable artificial lighting installation. It was essential to obtain clear views of some 150 glazed instrument dials, and specular reflections from their front glasses had to be avoided. Maintenance of the plant demanded the maximum degree of shadow reduction, a difficult problem where heavy overhang of engine casings occurs at several levels. Good light penetration into open cylinders also demanded high diffusion of light.

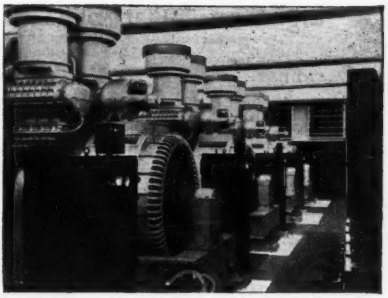
For these reasons an indirect lighting system was obviously necessary. Fortunately the building structure aided the lighting engineer, as transverse beams 4 ft. 6 in. deep crossed the ceiling midway between each generating set, and advantage was taken of this feature to mount continuous lines of "Crompton" (AG. 1731) indirect cornice reflectors housing 5 ft. 80 w. daylight fluorescent tubes.

The lighting fittings run flush with the lower edge of the beams and are fixed each side. Similar lines of fittings are placed on the end walls with a further line along one side to provide extra illumination over the generator ends and the switchboard.

A total of 84 fittings are employed to provide an average service illumination intensity of 12.0 foot-candles (lumens per sq. ft.) at a utilisation coefficient of 0.17.

The accompanying photograph conveys the impression of visual comfort which is a feature of the job. With all the high diffusion effects, the machinery, which is finished matt aluminium colour, does not lose its form. Reports from the maintenance staff indicate no need for auxiliary lighting aids even for major replacements work within the engine casings.

The electrical maintenance department of Vauxhall Motors Limited, and the lighting section of Crompton Parkinson, Limited, co-operated to devise the lighting scheme.



A section of the underground generating station lighted by indirect fluorescent fittings.

French Engineers visit Birmingham Works of Chance Brothers

The British Council in Birminhgam recently arranged a course for 20 high ranking French engineers on "Applied Science in Industry." This course included delegates from a group which is an organisation subsidised by the French Government and is in touch with 2,000 industrial units employing five million French industrial workers.

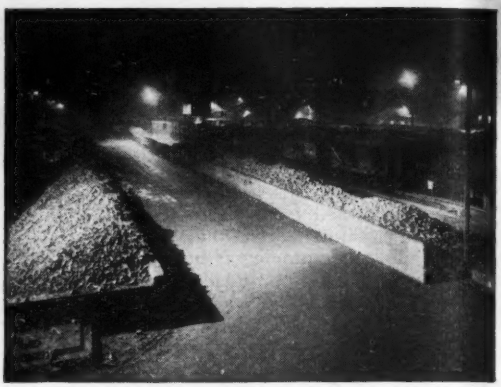
One section of the course dealt with automatic control mechanisms, and in this connection arrangements were made for the French delegates to visit Messrs. Chance Brothers' engineering shop at Smethwick, where one of the most up to date mechanised shops in the country engaged in the mass production of glass is in operation.

Sodium Lamps: Price Reduction

The Electric Lamp Manufacturers Association recently announced substantial reduction in the price of sodium lamps. For the four types listed (45, 60, 85 and 140 watt) the reductions range from about 6 to about 12 per cent. Fuller details may be obtained from the Association at 35, Bedford-square, London, W.C.1, or from any E.L.M.A. member.

Light on Sugar Beet

The picture shows the silos and rail sidings at the British Sugar Corporation's Poppleton factory, York, where a lighting installation, enabling sugar beet to be received by road and rail throughout the night, has just been completed by the G.E.C. Lighting is effected by 23 Duoflux floodlights and five Difractor street lighting lanterns. The floodlights are equipped with 400-watt Osram H.P.M.V. clear lamps. Two chokes are enclosed in weather-proof box housing at the foot of each pole, but power factor correction is effected at the source. This is a good instance of the many processes where artificial light can render signal service by facilitating regular nightwork and thus enhancing the possible output of work during the 24 hours.



Dr. J. N. Aldington

It is announced that Dr. J. N. Aldington, B.Sc., Ph.D., F.R.I.C., F.Inst.P., F.I.E.S., who has been associated with Siemens Electric Lamps and Supplies, Ltd., at their Preston lamp works for 25 years, was elected to the board of that company on July 1. He has also been appointed director of research and deputy works manager at Preston.

Dr. Aldington is well known throughout the world for his outstanding work on light sources and has contributed a number of valuable papers on this subject to the I.E.S. and to other bodies.

All I.E.S. members and other friends will join with us in congratulating Dr. Aldington on his new appointments.

Plastics in Lighting

The paper on plastics given by Dr. Harper and Mr. Walker at the recent I.E.S. Summer Meeting (reported elsewhere in this issue) has given rise to considerable interest in the use of this material for lighting fittings.

The chief fabricators of lighting fittings made of "Perspex" in this country are the Triplex Safety Glass Co., Ltd., who have been responsible for some interesting designs for interior lighting fittings as well as street lighting lanterns and mine lighting fittings.

The use of plastics in these applications has so far been rather limited, but there would appear to be ample scope for development. Having somewhat different properties from those of glass, it would be reasonable to expect that designers will develop new types of fittings and not restrict themselves to designs already in common use.

The EDITOR Replies

We draw the attention of readers, and I.E.S. members in particular, to the *"Situation Vacant" notices* that appear on the following page. In this matter there has been a great transformation. At one time such notices related almost exclusively to offers of service, but few situations seemed vacant. Now the position is exactly reversed.

The suggestion that a *colour for fluorescent lamps midway between "daylight" and "warm white"* is needed has excited much interest. Dr. H. H. Ballin writes that a 4,500° K. "daylight" tube has been in production by his firm since 1941, when it was developed in co-operation with the M.O.W. for the underground fortresses. He agrees that this is the best colour for offices and stores, but there are yet warmer colours (e.g., "peach") which are often preferred in restaurants and when foodstuffs are on show.

Another topic of present interest is the application of *fluorescent lamps to street lighting*, of which a number of examples have recently been illustrated in our columns. Although it presents a complete departure from the methods popular immediately before the war (in general based on the control of light from sources of concentrated brilliancy), and although an inquiry conducted in the U.S.A. was definitely adverse, it does seem to be markedly popular for city streets. I have been told, however, that, as yet, it is making little progress in Eire.

The use of *fluorescent lighting in churches* seems also to be a debatable subject, a common view being that if used for concealed lighting (e.g., in the choir or chancel) it is often welcome, whereas it appears incongruous if the lamp is visible. One illustration in Mr. Hubble's interesting paper read at Harrogate seems at variance with this belief. In that case three vertical lamps, assembled on a wall panel in Gothic style, not only served as a substitute at night for the natural light from windows but proved in itself a pleasing arrangement harmonising with the general architectural scheme.

Mr. Hubble's paper, however, offers many problems for debate. In the course of some discussion thereon at Harrogate I heard the view expressed that the lighting of *large interiors solely by indirect means from friezes* (as is not infrequently attempted in lecture theatres) is rarely quite satisfactory. The massive pendants of the past, apart from their use to illuminate, had a definite function in rounding off the design

I believe that architects have gone so far as to prescribe an approximate ratio between the dimensions of the room and the fittings. In the case of very large interiors it may be difficult to provide diffusing fittings of adequate dimensions.

But here the modern acrylic plastics, such as those treated in another paper at Harrogate, may prove a godsend. For, with diffusing materials so much lighter than glass, it may be possible to build very large bowls to house powerful lighting units. I am told that some of the fittings thus produced verge on the gigantic.

SITUATIONS VACANT

GENERAL WORKS MANAGER required by **THORN ELECTRICAL INDUSTRIES, LIMITED,** to take over control and co-ordination of their factories producing **ATLAS** incandescent lamps. Under a recently concluded engineering and patent licence agreement with **SYLVANIA ELECTRIC PRODUCTS, INC.,** of U.S.A., the latest high-speed equipment will be installed in all factories, and it is essential that applicants should have considerable experience of incandescent lamp production on modern machines. Applications, which must give full details of past experience and will be treated in strict confidence, should be made to Production Director, 109, Judd-street, London, W.C.1.

EXPERIENCED LAMP ENGINEER required by **THORN ELECTRICAL INDUSTRIES, LIMITED,** for their **ATLAS** incandescent lamp factories, to take charge of centralised quality control, lamp data and manufacturing specifications. Applications, which must give fullest particulars of past experience and will be treated in strict confidence, should be made to Production Director, 109, Judd-street, London, W.C.1.

ILLUMINATING ENGINEERING ASSISTANT required for Luminaire Laboratory to investigate light distribution values, brightness figures, reflection factors, etc., for lighting fittings. Previous experience in light measurements essential. North London. State age, qualifications, experience, and salary. Apply, Box No. 780, "Light and Lighting," 32, Victoria-street, London, S.W.1.

FERGUSON RADIO CORPORATION has a vacancy for a light electrical engineer, with a wide knowledge of production methods and ability at cost price precalculation. Candidates preferred with degree or H.N.C. in electrical or mechanical engineering. Good salary offered to right man. Apply, Personnel Manager, Ferguson Radio Corp., Ltd., Gt. Cambridge-road, Enfield, Middx.

ASSISTANT ENGINEER required for development work on fluorescent lamp auxiliaries, H.N.C. standard or equivalent. Salary according to qualifications and experience. North London. Apply Box No. 781, "Light and Lighting," 32, Victoria-street, London, S.W.1.

COMMONWEALTH OF AUSTRALIA

LIGHTING ENGINEERS

The Australian Department of Labour and National Service invites applications from British subjects for appointment to the following positions in its Factory Standards and Design Branch: **ENGINEER,** Grade 3 **(LIGHTING),** Adelaide and Brisbane, £756-823 p.a. Duties: Plan and conduct research into artificial and national lighting problems in industrial buildings; prepare technical information for publications; advise on standards. **ENGINEER,** Grade 2 **(LIGHTING),** Melbourne, £688-733 p.a. Duties: Conduct research into artificial and natural lighting problems in industrial buildings; prepare technical information for publications. Qualifications required are: Degree or diploma in Electrical Engineering or Science; experience or interest in research associated with problems of natural and artificial lighting; ability to co-operate with industrial and professional organisations and carry out educational activities. Employment for two years is guaranteed, subject to satisfactory service. Commencing salaries within the ranges fixed according to qualifications and experience. Further particulars will be given to applicants with suitable qualifications.

Applications giving name and address, date and place of birth, nationality, qualifications and experience (including war service) should be sent as soon as possible to Mr. T. C. Graham, Australia House, Strand, London, W.C.2.

[*We shall be glad to hear from any I.E.S. members or others who have successfully made applications for any of the above appointments.*—ED.]

Floodlighting Falmouth Docks

Fig. 1. A general view of the docks floodlighted.

The docks at Falmouth played an important part in both world wars and to-day they still handle some 400 to 500 ships annually, mostly of the large tanker class. In all modern docks it is of great importance that loading and unloading should proceed smoothly and without interruption by day and night. Hence the need for effective floodlighting.

At Falmouth this need has recently been met through the installation, by Metropolitan-Vickers Electrical Co., Ltd., of long-range and wide-angle floodlights fitted with Cosmos 500-watt lamps, whilst lamps of similar power in "Gower" street lighting lanterns serve to afford general illumination.

Features of special interest are the special provision for easy maintenance and the devices to secure correct focusing. The 50 ft. steel poles, illustrated in Fig. 2, are equipped with maintenance ladders and are either surface mounted with a base plate and fillets or have a 6-ft. root fitted below the jetties.

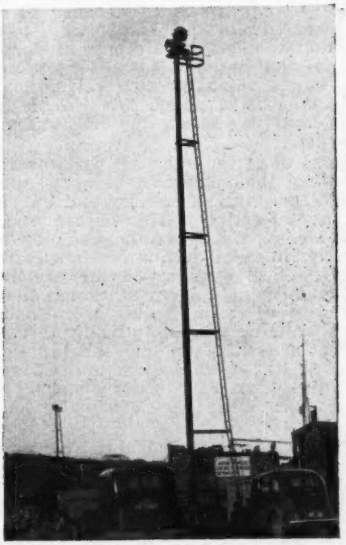


Fig. 2. One of the special floodlighting units.

Reviews of Books and Publications Received

Lighting to Stimulate People. By J. Lloyd Kamm. (Christopher Publishing House, Boston, U.S.A. 174 pp.; Price, 2.50 dollars.)

Discharge Lamps for Photography and Projection. By H. K. Bourne. (Chapman and Hall, London. 424 pp.; Price, 36s.)

Few will disagree with Mr. Kamm's premise that a lighting installation should do more than enable some visual task to be performed. Lighting can affect our moods and emotions, and good lighting should produce a sensation of exhilaration or quiet, excitement or serenity, as the situation demands. The lighting of a "10 cent" store will be different from that of a Fifth-avenue grocery shop; a service station will not be treated in the same way as a mortuary. This is a theme so fundamental that it tends to be forgotten in the welter of engineering calculations: it is the theme which Mr. Hubble developed in his paper at the I.E.S. summer meeting.

Some of us may go part way towards agreeing that direct lighting is more suited for physical activity and indirect for mental activity. But we cannot follow Mr. Kamm when he explains his theories in detail letting his fancies run freely. Mere ordinary mortals are then left floundering in a sea of human auras, "centers of being," and vibrationary rates while he presses on boldly through cycles of civilisation and the illumination needs of the Christian Church, with the aid of a frequency meter which is a sort of super-electro-encephalograph.

There may be a good deal worthy of thought in this book, but its overebullient and under-discriminating presentation rather discourages the effort.

Mr. Bourne writes in very different vain: factual, concise, and well-illustrated (186 line drawings and photographs); his book should interest all photographers and prove of value to many. All types of lamp-incandescent filament, high and low pressure discharge, fluorescent-arc finding use in these days when photography is an increasingly valuable tool to the technician. Every field of research employs the camera in ways varying from the simple record to the examination of rapid movement or the understanding of micro-structures. The pictorial photographer, too, has much to gain from the advances of lamp making. Better tone gradation or colour rendering, higher efficiency and cooler radiation, and powerful flashing sources are among the improvements of the last few years.

It has been difficult to keep pace with these rapid and revolutionary changes in light-sources. (Mr. Bourne, one observes, does not refer either to the double-negative arc lamp or the zirconium lamp, both of which, introduced fairly recently, are likely to be important.) The next few years may see much of present practice rendered out-of-date. But doubtless one might forever put off the labour of writing such a book by arguing that tomorrow will see some further development.

The description of lamps are intended for the engineer and will interest many whose occupation is not primarily concerned with photography or projection. Details of lamp constructions give an added interest to their use and the salient information on performance is fully described. One would like to see the sections on application expanded, but the author may well argue that these techniques are more likely to alter than lamp characteristics: and his lamp descriptions continually impress on the reader the photographic and projection aspects which he has in mind. Each chapter has a useful list of references and there are ten appendices. The book is well bound and printed.